

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 16357-WO-03	<b>FOR FURTHER ACTION</b>	
See Form PCT/IPEA/416		
International application No. PCT/A/2005/000127	International filing date (day/month/year) 03.02.2005	Priority date (day/month/year) 05.02.2004
International Patent Classification (IPC) or national classification and IPC G01S17/89, G01S17/10		
Applicant RAFAEL-ARMAMENT DEVELOPMENT AUTHORITY LTD.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 4 sheets, as follows:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand 02.12.2005	Date of completion of this report 30.01.2006	
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Grübl, A Telephone No. +49 89 2399-7138	
		

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**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-13 as originally filed

**Claims, Numbers**

1-7 filed with the demand

**Drawings, Sheets**

16-3/6, 5/6, 6/6 as originally filed  
4/6 filed with the demand

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos. 1
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-7
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-7
Industrial applicability (IA)	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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The following documents are referred to:

D1: US-A-5 231 401 (KAMAN ET AL) 27 July 1993 (1993-07-27)  
D2: US-B1-6 320 611 (PEPIN CHRISTIAN) 20 November 2001 (2001-11-20)

**Item I**

The amendments to claim 1 go beyond the disclosure of the application as filed (Article 34(2)(b) PCT). The description explicitly specifies that "each image is captured during a very short period" (page 11, lines 15-17; see also original claim 1, feature (e.ii)). This is the opposite of the newly introduced disclaimer "activating in a non-gated manner". Therefore, this amendment will be disregarded in the following examination (Rule 70.2(c) PCT).

**Item V**

The subject-matter of claims 1-7 lacks inventive step (Article 33(1)(3) PCT) regarding D1 as closest prior art.

**Claim 1**

D1 discloses an airborne *long-range* (D1, column 1, line 13) laser imaging system (D1, abstract; column 1, lines 12-21), *for obtaining an image showing high resolution details of a specific object having dimensions in the order of several metres*, comprising:

- a. A laser source and a focal plane array *sensing detector*, both being mounted on a same gimbals platform (D1, column 4, lines 29-31);
- b. A pulse generator for providing a series of pulses to said laser source during a *step-scanning* period, thereby activating laser illumination by said laser source during each of said pulses, the laser source being characterized in that its illumination beam is so concentrated that *it produces (an) illumination spot that covers only a portion of said object* (D1, column 2, line 64 - column 3, line 4);
- c. A scanning unit for receiving a line of sight direction to *said object* [...] and for

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effecting a stepping *image capturing sequence* in such a manner as to scan *the object and the area in which said object is included* (D1, column 2, line 64 - column 3, line 4), *wherein said area having dimensions in the order of up to a few tens of metres* (D1, column 4, line 17: a moored mine is included in an area of up to a few tens of metres);

- d. A motion compensation unit for providing to said gimbals, in addition to said scanning signal a motion compensation signal for compensating for the aircraft motion and for the aircraft vibrations (D1, column 4, line 55 - column 5, line 10);
- e. A timing unit for:
  - i. Activating, in coordination with the said scanning unit, said pulse generator during the scanning period, in order to produce over the target a plurality of illumination spots, each relating to one of said laser pulses, and wherein each of said spots overlaps at least a portion of one or more adjacent spots (D1, column 2, lines 32-56; column 6, lines 61-68); and
  - ii. Activating [...] said focal plane array *sensing detector* during the illumination of the target by each specific pulse in order to capture a *plurality* of distinct spot-images, each relating to a *single* illumination pulse (D1, column 8, lines 62-67);
- f. A memory unit for receiving from said focal plane array *sensing detector* the captured spot-images, and for storing them (D1, figure 4);

The subject-matter of claim 1 differs from the system of D1 in:

- c. A scanning unit for providing a scanning signal to the gimbals for effecting a stepping *image capturing sequence*;
- g. A correlating unit for correlating images stored in said memory by finding similarity between features of overlapping portions of neighbouring spot-images; and
- h. A combining unit receiving information from said correlating unit for combining the spot-images to form a complete image of the scanned area.

From these differences two objective problems result which are not related to each other:

- i. Avoiding the use of a separate deflection device.

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II. To combine the sub-images insusceptibly to motion-induced errors.

The solution of problem I is obvious from D1 itself. D1 discloses (D1, column 5, lines 3-10) that the gimbals permit changes in orientation of the lidar system in order to expand its viewing area. Due to the existence of two different deflection devices (gimbal and mirror) in one embodiment of the invention of D1, it would be obvious to the person skilled in the art to replace the one with the smaller viewing angle - the mirror - by the functions of the other. From another point of view, the gimbals could be seen as including the mirror and, therefore, the whole feature c is disclosed by D1.

As to problem II, D1 does not give instructions on how to combine the images. Thus, the person skilled would consult the patent literature for systems which combine several sub-images into a single image and would find for example D2. D2 discloses an airborne imaging system which combines multiple images having a narrow field of view into an image having a wider field of view (D2, abstract) using a correlating unit according to feature g (D2, abstract) and a combining unit according to feature h (D2, abstract).

Therefore, solving problems I and II, the person skilled in the art would positively arrive at the system of claim 1 without exercising inventive skill.

The features of the *object having dimensions in the order of several metres* and that (consequently) the illumination spot covers only a portion of said object are not features of the system itself. They are to be construed as the system being suitable for obtaining images of such an object. The system of D1 clearly is suitable for that.

The features of **dependent claims 2 and 3** result from the geometric facts of the system of claim 1, the features of **dependent claims 4, and 7** are matters of engineering choice. The feature of **dependent claim 6** that the width of the illumination beam is in the range from 0.1 to 0.4 mrad would result from an adaptation to a specific target range which is regarded as a matter of engineering choice.

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**Item VII**

The present application does not meet the requirement of Rule 5.1 (a)(ii) PCT, because the description does not indicate the relevant background art constituted by D1 and D2.

The present application does not meet the requirement of Rule 6.2 (b) PCT, because the technical features mentioned in the claims are not followed by reference signs relating to such features.